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THE TOBACCO FLEA-BEETLE

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BULLETIN NO. 266

The Tobacco Flea-Beetle

By H. H. JEWETT

FOOD PLANTS

The tobacco flea-beetle feeds upon the different kinds of Solanaceae and seems to prefer tobacco as a host plant. In addition to tobacco it was found feeding on tomato, potato, horse-nettle, groundcherry, eggplant, pepper plants and jimson-weed. It frequently became quite numerous on tomato and potato plants. It was reared on tobacco, tomato and horse-nettle.

CHARACTER AND EXTENT OF INJURY

The injury to tobacco or other host plants by the adults consists of the eating of small holes or punctures partially or entirely thru the leaf. Sometimes the leaf is partially skeletonized, but usually the punctures are scattered over the surface of the leaf. The young plants in the beds are sometimes severely in-

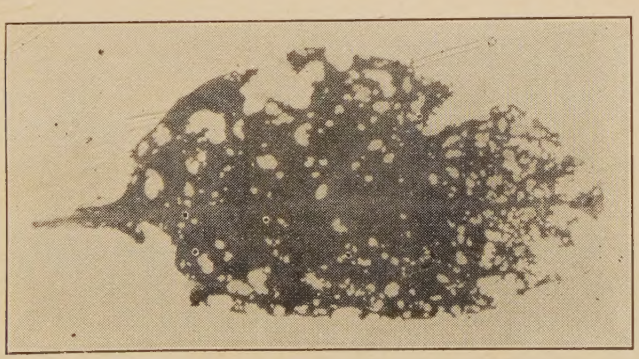

Fig. 1.—Tobacco leaf showing flea-beetle injury.

jured or weakened so that they are not suitable for transplanting in the field. A severe attack upon newly transplanted plants, often results in greatly weakened or stunted plants, especially if the weather is not seasonable for quick growth of the plants. The injury to the plants is more noticeable in the beds and newly transplanted plants. The beetles feed mostly on the under side of the leaves and on those nearest the ground. Frequently, the lower leaves of young plants in the field are killed by the attack of the beetles.

The larvae injure the host plants by feeding upon and tunneling the roots and sometimes tunneling the stems. They are small, but the combined attack of a large number would undoubtedly result in considerable damage to the plants. Young tomato plants were frequently tunneled for two or more inches and the injury caused by a single larva in the stem sometimes caused very young plants to wilt and die.

DESCRIPTION OF STAGES OF THE BEETLE

Egg. The egg is elongate-oval and is very small, measuring about .412 mm. by .185 mm. It is pearly white when laid but changes to yellowish due to the developing embryo. A distinct sculpturing having the appearance of a fine network may be seen on the surface of the chorion under considerable magni-

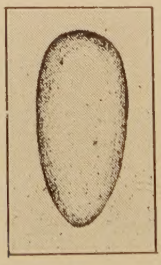

Fig. 2.—Egg of the tobacco flea-beetle. Enlarged.

fication. The egg surface is pliable so that the eggs are often crowded out of shape by other eggs or surrounding particles. The eggs are laid upon or very near the surface of the soil.

Larvae. The larvae of the tobacco flea-beetle are long, slender, worm-like grubs with the body segments of nearly equal size except the last, which is slightly smaller. There are twelve body segments. The three thoracic segments bear a pair each of

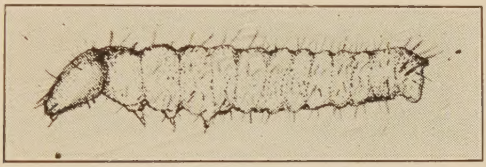

Fig. 3.—Newly-hatched larva of the tobacco flea-beetle. Enlarged.

short, segmented legs and on the last segment is a pair of prolegs. The larvae are whitish except the head, which is yellowish brown with reddish brown mouth parts.

The newly hatched larva varies from .6 mm. to .8 mm. in length and from .11 mm. to .16 mm. in width. The head is large in proportion to the size of the body at first but before reaching the first molt the body has lengthened and the head is not dispro-

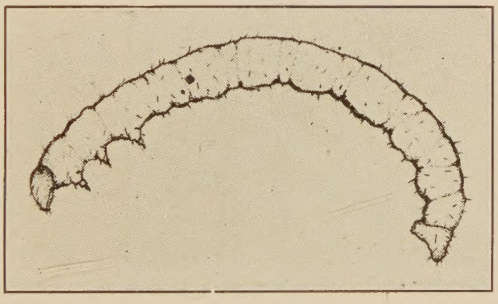

Fig. 4.—Full-grown larva of the tobacco flea-beetle. Enlarged.

portionately large. After a period of 3 to 6 days the larvae molt and, when measured shortly after molting, they varied in length from 1.4 mm. to 2.8 mm. The second molting takes place within 3 to 5 days after the first molt. The larvae at this stage varied in length from 2.43 mm. to 3.51 mm. Full-grown larvae reached the length of 3.78 mm. to 4.70 mm

Pupa. The full grown larva after completing its cell contracts, and remains in this condition for a day or two before shedding its skin and entering upon the true pupal stage. The larva in this stage is approximately one-half the length of the

Fig. 5.—Pre-pupa of the tobacco flea-bettle. Enlarged.

full grown worm. The pupa is white or slightly grayish and when just formed is a little longer than the mature pupa. The pupa is similar in appearance to other Chrysomelids and more nearly resembles the adult than the other stages, the antennae, legs and wings being wholly or in part visible. The pupae vary in length from 1.62 mm. to 1.96 mm., and in width from .62 mm. to .81 mm.

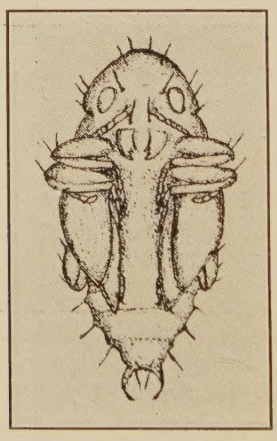

Fig. 6.—Pupa of the tobacco flea-beetle. Enlarged.

Adult. The tobacco flea-beetle is a very small insect measuring from 1.5 mm. to 2 mm. in length. The body is oblong-oval in shape and the color, in general, dull reddish yellow. The

elytra are marked with a fuscous transverse band, and the antennae and legs are pale reddish-yellow, except the femora of the metathoracic legs which are reddish-brown. The hind fe-

Fig. 7.—Adult tobacco flea-beetle. Enlarged.

mur is developed for leaping. The thorax is convex and rather coarsely and sparsely punctuate. The elytra are striated by coarse punctures.

LIFE HISTORY AND HABITS

The Egg

Place where Deposited. The beetles lay their eggs upon or very near the surface of the soil near the host plant where the soil is shaded and they always select moist soil in which to place them. The eggs usually are placed with the small end pointing downward, but they may be found in a great many positions. The eggs usually are crowded within a small crevice or between particles of soil and there may be several eggs in one mass.

Number of Eggs Deposited. The number of eggs laid by the females seems to vary considerably. The overwintering females laid more freely than late brood adults, in breeding jars at any rate, and about double the number of eggs. Seven overwintering females laid 151 eggs from May 15 to May 22, 1922. Three overwintering females found mating on May 8, 1923, were placed in a cage with the males, and from these 428 eggs were collected from May 21 to June 15. The beetles died some time between June 15 and June 20. Two reared first brood females in 1923, laid 148 eggs from the beginning of the egg laying on June 30 till

the end of of egg laying on August 14, or on average of 74 eggs. These two females died some time between August 14 and August 18. Very frequently eggs were found in masses of five or six or more, which indicated that they had been laid by a single female.

Incubation Period. The average incubation period for eggs laid by overwintering adults was 6.94 days for 151 eggs laid on May 15 to May 22, 1922; 6.68 days for 497 eggs laid May 21 to June 11, 1923; and 6 42 days for eggs laid on May 14 to June 5. 1924. The range of incubation periods was 6 to 8 days in 1922, 5 to 8 days in 1923 and 6 to 13 days in 1924.

The average incubation period for eggs laid by first-brood adults was 6.76 days for 464 eggs laid on June 24 to August 18, 1923, and 6.22 days for 106 eggs laid on June 30, to July 1, 1924. The range of incubation periods was 6 to 8 days in 1923 and 5 to 8 days in 1924.

The average incubation period for eggs laid by second-brood adults was 6.46 days for 292 eggs laid on August 11 to August 24, 1923, and 6.54 days for 184 eggs laid on August 13 to September 5, 1924. The range of incubation periods was 6 to 8 days in 1923, and 6 to 9 days in 1924.

The Larva

Larval Period. The larva, when full grown, constructs a small cell within which it presently becomes very much shortened and in this condition remains for one or two days before shedding its skin for the last time. The larval period was determined for 205 individuals during the season of 1923 and 1924. The average larval period for 60 individuals of the first brood in 1923 was 18.05 days; the minimum period was 16 days and the maximum 23 days. For the first brood in 1924, the average larval period for 24 larvae was 15.79 days; the minimum period was 13 days and the maximum period 25 days. The average larval period for 63 larvae of the second brood in 1923 was 19.63 days; the minimum period was 14 days and the maximum period 29 days. The average larval period for 18 larvae of the second brood in 1924 was 15.61 days; the minimum period was 14 days

and the maximum period 20 days. Third brood rearings in 1923 gave an average larval period for 25 larvae of 19.6 days, with a minimum period of 17 days and a maximum period of 22 days. Third brood rearings in 1924 gave an average larval period of 17.33 days for 15 larvae with a minimum of 15 days and a maximum of 20 days.

Larval Instars. The larva molts three times, two times during its active period and a third time while it is in its cell and just before pupation. The time of the third molt is easy to determine, but the other molts are difficult to determine, because the larva remains hidden at least a part of the time within the plant tissues and because of the difficulties encountered in rearing the larvae to maturity. The larval instars were determined for 14 larvae during the season of 1924. The average duration of the first instar was 4.57 days, of the second 3.92 days, and of the third 5.36 days. The first instar ranged from 3 to 6 days, the second from 3 to 5 days, and the third 4 to 7 days. The table of rearings give larval periods.

Larval Habits. The larva after hatching begins actively crawling about in search of food. They bore into and tunnel the fine rootlets of the host plant and sometimes into the tender stems. The larvae also gnaw and girdle the rootlets or chew them off. Larvae that were reared on very young tomato plants frequently tunneled the stems for an inch or more above the soil and these plants generally wilted and died. The larvae when mature leave the host plants, if they are within the tissues, and construct small earthen cells in which to pupate. Most of the cells were found close to the surface of the soil.

The Pupa

Pupal Period. The full grown larva contracts in its cell and then pupates within a day or two. The pupal cells are simple earthen cells and may be found at a depth of about one-half inch below the surface of the soil, tho some were found in the soil at a depth of four inches. The average pupal stage is nearly 5.5 days and the range 3 to 9 days.

The Adult Stage

Habits of the Adult. The adult remains in the pupal cell for one or two days after transformation from the pupa and at this time is almost white with the elytra soft and pliable. The newly transformed adults require several days in which to become normally colored.

The young beetles begin feeding on the leaves that rest on the ground and gradually work to the leaves higher up. They do most of their feeding on the under surface of the leaves, eating partly thru the leaf during the first feedings and later entirely thru the leaf.

The overwintering adults attack the plants in the seed beds, eating holes in the leaves which frequently results in dwarfing or killing the plants. The beetles later attack newly transplanted plants, attacking first the wilted leaves next to the ground and later the new leaves as they grow. If the beetles are numerous, the newly set plants are greatly weakened and frequently have to be replaced. Later in the season, even with the coming on of new broods of beetles, the injury is generally not so noticeable because of the greater amount of plant growth. The beetles feed mostly on the lower leaves, probably because of the greater density of the shade.

Oviposition. The beetles begin depositing eggs shortly after the first week of May and from then on to the first week of September eggs may be found. In the field an occasional mating pair may be found as late as September 10, which indicates a still later egg laying date. However, no eggs were obtained from 500 beetles collected on September 12 and September 13 nor from 200 beetles collected on October 5, 1923.

In breeding cages, overwintering beetles began depositing eggs on May 15, 1922; on May 14, 1923; on May 12, 1924; and on May 10, 1925, and continued to lay to June 20, 1922; to June 22, 1923; and June 29, 1924. The oviposition period was not followed in 1925.

First brood females began depositing eggs on June 25, 1923 and eggs were deposited to August 23 by members of this brood

that emerged in breeding cages to July 3. First brood females began depositing eggs on June 30, 1924.

Second brood females in 1923 deposited eggs from August 11 to August 24. This was a very short period, but members of this brood were kept in breeding cages till October 17. Second brood females in 1924, deposited eggs from August 13 to September 5. Members of this brood were kept in breeding cages till October 1.

Longevity. The tobacco flea-beetle lives for several weeks and may be found on host plants from early spring till late in the fall. This long life period produces an overlapping of broods in the field and makes them difficult to separate. Several lots of beetles were confined in cages in order to determine the longevity of the beetles. A lot of 40 beetles collected on May 14, 1923, were all dead by August 1. On May 13, 1924, 81 beetles were collected and put into a cage and the last of these died on July 15. A third lot of 98 beetles collected May 7, 1925, were all dead by July 11.

First brood adults placed in a cage June 25, 1923, were all dead by September 20. There were 25 beetles in this lot. A second lot of 30 first brood adults collected from breeding cages on July 3, 1924, were all dead by August 28. The life period for some of the adults in confinement was as much as 77 days for overwintering adults and 62 days for first brood adults.

Number of Broods. A study of the tobacco flea-beetle showed that there may be three broods in a season. First brood adults begin to appear at the middle of June, second brood adults during the last week of July, and third brood adults after the first week of September. The long life period of the adults leads to an overlapping of broods, so that they cannot be separated readily, especially after mid-season. The third brood is not a full brood. Late appearing second brood adults failed to deposit eggs in breeding cages and very few matings were observed in the field in September and none after September 10. A collection of 500 beetles placed in cages on September 12 and September 13, 1923, failed to deposit eggs.

Hibernation. The tobacco flea-beetle hibernates as an adult. The beetles collect in the fall or late summer on the suckers that grow from the stubs left after the tobacco is cut and may be found there until this growth is killed by frost. With the coming of heavy frosts and cold weather the beetles seek winter quarters under the leaves or trash near the seed beds or tobacco fields. In the spring, the beetles become active and appear on the tobacco beds when the plants are very small. Other host plants are attacked in the spring, but the tobacco beds usually furnish the first available food supply. The first beetles in the spring usually are noticed about the first of May.

SUMMARY

The tobacco flea-beetle, *Epitrix parvula,* becomes active in early spring and attacks the plants in the beds and, later, the transplanted plants.

Eggs are deposited from early May till the first week of September by overwintering adults and members of the different broods. The eggs are deposited close to the surface of the soil near the host plants, the beetles preferring rather moist soil for places of egg deposition.

The adult emerges in 23 to 45 days after the egg is laid. The egg stage lasts from 5 to 13 days, the larval stage from 13 to 29 days and the pupal stage from 3 to 9 days.

Three broods may appear during the season. The broods are difficult to separate in the latter part of the season, because of the long life period of the adults and the overlapping of oviposition periods.

The beetle hibernates in the adult stage. In the winter, after the host plants have been killed by frosts and freezes, the beetles seek winter quarters by crawling under loose litter or other materials near the plant beds or tobacco fields.

TABLE 1.—INCUBATION PERIOD OF EGGS

First Brood	1922	
Average	6.94 days	No. of eggs
Range	6–8 days	151
First Brood	1923	
Average	6.9 days	No. of eggs
Range	5–8 days	497
Second Brood	1923	
Average	6.76 days	No. of eggs
Range	6–8 days	464
Third Brood	1923	
Average	6.46 days	No. of eggs
Range	6–8 days	292
First Brood	1924	
Average	6.42 days	No. of eggs
Range	6–13 days	436
Second Brood	1924	
Average	6.22 days	No. of eggs
Range	5–8 days	106
Third Brood	1924	
Average	6.54 days	No. of eggs
Range	6–9 days	184

TABLE OF REARINGS

Table 2.—First Brood, 1923

Incubation Period of Egg	Larval Period	Pupal Period	Egg to Adult	Number
days	days	days	days	Reared
Average 6.10	18.05	5.28	30.88	60
Range 5–8	16–23	4–8	28–36	

Table 3.—Second Brood, 1923

Incubation Period of Egg	Larval Period	Pupal Period	Egg to Adult	Number
	days	days	days	Reared
Average	6.55	19.63	5.61	32.30	63
Range	6–8	14–29	4–9	26–44	

Table 4.—Third Brood, 1923

Incubation Period of Egg	Larval Period	Pupal Period	Egg to Adult	Number
	days	days	days	Reared
Average	7.16	19.60	6.24	33.01	25
Range	6–8	17–22	5–8	26–30	

Table 5.—First Brood, 1924

Incubation Period of Egg	Larval Period	Pupal Period	Egg to Adult	Number
	days	days	days	Reared
Average	6.58	15.79	4.70	27.08	24
Range	6–12	13–25	3–8	23–42	

Table 6.—Second Brood, 1924

Incubation Period of Egg	Larval Period	Pupal Period	Egg to Adult	Number
	days	days	days	Reared
Average	6.33	15.61	5.16	27.11	18
Range	5–7	14–20	4–7	25–31	

Table 7.—Third Brood, 1924

Incubation Period of Egg	Larval Period	Pupal Period	Egg to Adult	Number
	days	days	days	Reared
Average	6.26	17.33	5.33	28.92	15
Range	5–7	15–20	4–8	26–31	

Table 8.—Development Period, Egg to Adult

Brood	First	First	Second	Third	First	Second	Third
Date	1922	1923	1923	1923	1924	1924	1924
No. reared	89	156	144	99	214	41	39
	days	days	days	days	days	days	days
Average	35.66	31.02	31.08	33.01	35.25	31.27	32.92
Range	31–42	26–36	25–44	30–41	23–45	23–34	25–39

EXPLANATION OF THE TABLES

Incubation Period of the Eggs

Table 1. The incubation periods in Table 1 are for eggs laid on the following dates: First brood, eggs laid May 15 and May 19 to May 22; first brood, 1923, eggs laid May 21 to June 11; first brood, 1924, eggs laid May 14 to June 5; second brood, 1923, eggs laid June 24 to August 18; second brood, 1924, eggs laid June 30 to July 17; third brood, 1923, eggs laid August 11, to August 24; third brood, 1924, eggs laid August 13 to September 5.

Table of Rearings

The tables of rearings are summaries of complete rearings and do not include rearings in which one or more of the stages were not determined.

Table 2. The eggs for these rearings were laid on May 21 and May 22, May 24 and May 25, May 28 and June 3. The reared adults appeared on June 16 to August 8.

Table 3. The eggs for these rearings were laid on June 24, June 26, June 28, June 30, July 2 to July 4, July 6, July 12, July 16, July 18, July 23 and August 1. The first adult appeared July 23, the last September 5.

Table 4. The eggs for these rearings were laid on August 11 and August 12, August 16 and August 17 and August 22. The reared adults appeared September 11 to September 26.

Table 5. The eggs for these rearings were laid May 12, May 28 and June 5. The first adults emerged June 16 and the last on July 8.

Table 6. The eggs for these rearings were laid on June 30 and July 1. The adults emerged July 26 to August 1.

Table 7. The eggs for these rearings were laid on August 13 to August 15. The adults appeared on September 11 to September 25.

Table 8. The period of development from the beginning of the egg stage to the appearance of the adult for several members of the different broods is summarized in this table.

METHODS OF REARING

Eggs were secured by confining adults in lantern globes which were covered at both ends with organdy or similar cloth and set upon a black paper upon the soil in a flowerpot. The paper was kept moist by being in contact with the moist soil in the flowerpot. The beetles thrust their ovipositors thru the cloth and deposit their eggs on the paper, where they can be seen. This method of securing eggs has been used by other investigators. By this method, many of the eggs adhere to the cloth and are difficult to pick off. In another method which was used, the beetles were placed in a glass tumbler which contained at the bottom a small clod of moist earth and in addition some leaves for food. The clod of earth was later examined under a binocular microscope and the eggs separated out with a dissecting needle. This method generally yielded the greater number of eggs and they were easily picked out of the soil.

To obtain the incubation period, the eggs were placed on moist soil in small covered dishes and notes made of the hatching dates.

The larvae were raised by placing them on small tomato or tobacco plants growing in sand in test tubes, or on short pieces of roots or tender stems. It was necessary to keep the pieces of roots or stems in stoppered vials or covered dishes in order to confine the larvae and prevent the pieces from drying out. Soil was given at the proper time for pupation or the sections of roots or stems were kept on moist soil thruout the growth of the larvae. The larvae at maturity crawled into the soil to pupate. The

molts were obtained by dissecting the pieces of roots or stems, and by following the burrows made by the larvae, the cast skins generally were found in the burrows.

The pupal period was obtained in a good many cases by having the soil in which the larvae were to pupate spread out in a thin layer in the dishes so that many of the larvae went down thru the soil to make their cells next to the glass, but at other times it was necessary to examine the soil by picking it apart with a needle point.

CONTROL MEASURES

Location and Protection of the Plant Bed. The plant bed should be located, if practicable, at a considerable distance from the hibernating quarters of overwintering beetles. The hibernating quarters are generally not far from the tobacco fields of the previous season, places not in cultivation and covered with natural growths and furnishing sufficient materials within which the beetles may hide.

The land that is selected for the plant bed should be thoroly burned or steamed in order to kill hibernating insects. After the bed has been prepared and sown, boards should be set up around the borders of the bed with soil banked around the outside, and finally a good grade of tobacco cotton should be stretched over the bed and fastened securely to the boards. If the boards are properly banked and the covering is carefully sewed and fastened, very few beetles will gain entrance to the beds.

Control of the Beetles in the Bed. The beetles in plant beds may be controlled by the application of poison either as dusts or liquid sprays. The choice of methods may depend upon the equipment available and experience of the grower. One or two light, uniform applications of arsenate of lead powder or of the spray made of two pounds of arsenate of lead powder in 50 gallons of water generally are sufficient for keeping the beetles under control.

Control of the Beetles in the Field. If the plants in the beds are dusted or sprayed shortly before being set in the field,

there will be enough poison on the plants to protect them to a considerable extent. After the plants have been set in the field, they may be dusted with arsenate of lead powder or sprayed with a mixture of 1½ pounds of arsenate of lead and 50 gallons of water. Paris green may be dusted on the plants at the rate of ¾ pound to 1½ pounds per acre according to size of plants.

Destruction of Remnants of the Crop. After the tobacco has been cut, the stumps should be plowed under or destroyed. The second growth or suckers that spring from the stumps furnish food late in the season for the beetles at a time they are getting ready to go into hibernation and by depriving them of this food supply many will not live till the time for hibernation.

TEMPERATURE RECORDS FROM U. S. WEATHER BUREAU REPORTS

Date 1922	April		May		June		July		August		Sept.		Oct.		Nov.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	43	34	76	53	73	61	88	73	84	65	88	69	84	66	76	53
2	59	37	75	60	67	60	82	71	80	62	89	69	84	66	72	53
3	73	48	69	59	78	62	72	61	84	66	83	67	86	67	63	49
4	77	57	75	59	80	63	71	58	84	66	86	72	87	65	67	48
5	68	56	73	57	83	65	77	55	86	67	91	69	85	63	71	50
6	73	56	71	59	82	66	82	62	90	69	93	72	84	62	61	49
7	81	60	72	58	88	65	84	64	87	71	93	72	76	62	58	44
8	81	66	78	55	80	67	82	67	76	63	94	74	64	52	51	39
9	72	56	87	62	77	67	88	68	77	56	90	70	57	53	49	35
10	82	62	84	62	84	67	89	71	77	55	89	69	61	50	60	33
11	74	45	81	64	84	62	88	72	85	58	69	59	58	48	66	44
12	61	43	83	66	83	70	89	70	84	65	74	57	56	42	66	55
13	77	55	77	62	84	60	82	68	89	68	83	61	64	38	73	55
14	80	50	74	59	84	68	82	62	90	67	86	66	72	49	62	57
15	61	45	74	58	88	69	87	65	92	68	87	65	74	55	60	35
16	76	48	79	59	90	72	86	69	92	71	77	59	70	58	49	33
17	77	57	71	57	91	69	88	70	93	69	71	53	58	41	61	39
18	59	45	68	53	82	67	83	70	93	70	77	49	56	38	57	48
19	61	41	64	52	85	62	81	64	87	68	80	62	63	41	61	42
20	54	35	72	52	82	68	82	62	80	62	70	60	68	50	42	32
21	59	43	81	61	83	64	86	63	83	61	78	60	68	51	43	32
22	51	36	83	59	79	62	90	69	87	69	83	63	72	54	40	30
23	57	40	86	64	87	62	85	68	80	66	85	67	60	43	55	30
24	69	40	84	66	90	66	86	68	83	69	83	58	60	39	43	26
25	59	55	75	66	88	70	88	68	83	68	68	49	67	45	35	20
26	66	55	78	65	87	64	91	69	79	64	74	47	59	45	37	22
27	56	44	78	60	90	68	93	74	76	61	78	61	70	43	37	31
28	55	39	75	57	82	65	92	72	82	62	81	62	78	57	37	29
29	62	37	79	58	80	65	86	67	83	63	83	62	79	59	46	26
30	69	47	83	60	88	72	79	65	80	63	84	63	78	57	58	37
31			86	63			87	69	86	66			73	48		

Date 1923	April		May		June		July		August		Sept.		Oct.		Nov.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	55	20	76	60	82	68	82	56	87	66	88	67	67	50	48	31
2	64	36	76	54	87	69	84	60	83	69	84	67	71	52	59	38
3	58	50	81	55	87	71	85	64	86	72	79	68	71	56	59	45
4	62	47	77	60	90	71	86	70	81	73	83	69	70	47	57	49
5	55	39	68	53	84	69	88	69	84	70	83	66	59	41	53	43
6	59	34	71	46	81	66	88	66	89	74	80	68	60	40	44	39
7	72	45	79	51	82	68	82	66	89	72	79	63	64	44	49	35
8	65	31	67	34	74	59	83	66	88	72	75	61	67	42	37	32
9	51	30	50	31	75	55	88	69	87	70	77	59	68	44	44	30
10	58	41	59	37	80	59	89	73	85	72	74	55	73	49	58	35
11	68	43	68	50	71	61	89	73	90	72	79	55	80	58	65	43
12	72	42	69	46	63	60	88	68	90	68	71	60	81	60	52	33
13	67	49	63	42	76	57	84	68	83	68	72	49	81	60	59	36
14	49	40	74	47	80	62	89	69	88	68	61	41	76	58	63	39
15	60	38	73	61	81	64	90	75	88	70	62	44	78	60	54	44
16	48	35	64	50	86	64	86	70	82	64	69	42	77	62	47	37
17	51	37	66	49	91	69	86	68	67	59	81	54	80	64	44	35
18	59	35	70	55	90	73	87	65	81	59	69	65	67	57	58	35
19	69	45	85	61	89	71	88	67	85	64	78	67	57	42	51	34
20	76	54	76	57	91	75	90	70	86	65	77	64	57	38	64	35
21	71	54	70	55	92	74	87	70	85	66	69	60	55	39	66	48
22	74	52	71	47	96	77	89	70	67	51	73	58	53	35	53	42
23	64	56	69	52	91	73	84	67	71	51	81	59	49	30	49	38
24	62	47	77	52	86	71	82	67	75	56	86	61	56	38	42	37
25	63	40	73	60	85	69	82	67	81	62	87	66	66	40	56	34
26	73	48	76	60	84	70	83	62	82	63	86	68	59	42	48	33
27	80	58	82	64	77	67	84	67	84	65	85	68	64	45	41	30
28	63	52	85	63	74	56	75	68	76	67	85	68	58	50	46	28
29	67	48	79	65	67	50	85	66	79	62	82	64	66	50	56	36
30	69	52	84	63	73	53	86	69	84	65	72	55	61	34	51	40
31			87	61			86	67	87	67			43	27		

Date 1924	April		May		June		July		August		Sept.		Oct.		Nov.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	33	25	61	42	66	56	72	57	83	66	87	71	63	38	66	41
2	45	28	67	45	68	53	72	54	75	64	71	55	75	48	68	41
3	63	36	71	52	68	54	74	53	88	66	71	51	76	56	68	37
4	57	46	65	47	73	54	74	58	91	69	78	57	76	59	74	54
5	64	45	82	47	82	56	77	61	92	72	68	54	78	60	71	53
6	59	46	84	66	74	61	71	61	91	69	70	47	78	65	71	59
7	72	42	84	62	84	57	81	60	83	69	79	55	78	62	73	43
8	77	44	62	46	86	70	84	63	87	71	73	59	72	54	43	36
9	64	48	57	45	85	66	86	68	86	68	64	48	77	49	52	40
10	52	40	58	44	83	67	82	65	85	68	63	43	77	57	54	34
11	57	39	53	42	80	64	86	68	83	60	81	53	78	56	68	50
12	63	45	67	47	83	67	81	67	76	58	85	61	80	57	56	48
13	71	47	70	53	87	66	83	68	80	59	65	58	78	60	71	48
14	72	55	59	44	82	67	76	68	77	54	74	56	79	60	59	43
15	82	54	55	43	85	64	82	65	83	60	73	54	80	63	45	35
16	82	62	61	46	78	64	81	65	72	66	75	54	78	58	50	30
17	68	49	71	49	86	62	77	60	78	63	71	58	80	64	43	25
18	59	41	69	55	89	70	75	57	76	55	68	53	78	60	36	29
19	62	40	70	51	91	72	78	64	80	57	81	61	80	62	45	32
20	56	43	58	52	92	75	89	67	79	70	76	66	71	44	55	37
21	78	43	62	45	81	72	90	74	91	70	81	66	53	37	54	42
22	53	41	65	43	85	69	90	75	93	74	69	53	46	36	42	35
23	63	38	75	54	82	66	87	71	89	72	68	55	57	34	49	32
24	80	53	73	48	80	66	87	70	88	64	78	48	63	43	38	28
25	74	59	58	44	85	70	77	66	81	64	79	60	69	47	35	26
26	61	51	70	46	87	68	80	63	86	64	79	59	68	48	50	28
27	72	53	71	56	83	67	87	67	90	68	78	60	62	51	44	33
28	64	49	74	58	88	71	88	68	84	66	66	52	68	49	39	24
29	72	48	80	52	79	62	90	70	85	62	53	43	73	52	27	21
30	68	48	64	48	75	59	88	70	93	67	47	40	76	54	33	22
31			70	52			85	69	94	73			66	50		

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